BID COST OF SHUTTLE FACILITIES

CONSTRUCTION BIDDING COST OF KSC'S SPACE SHUTTLE FACILITIES

BY

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KSC SHUTTLE CONSTRUCTION BID COST

INTRODUCTION

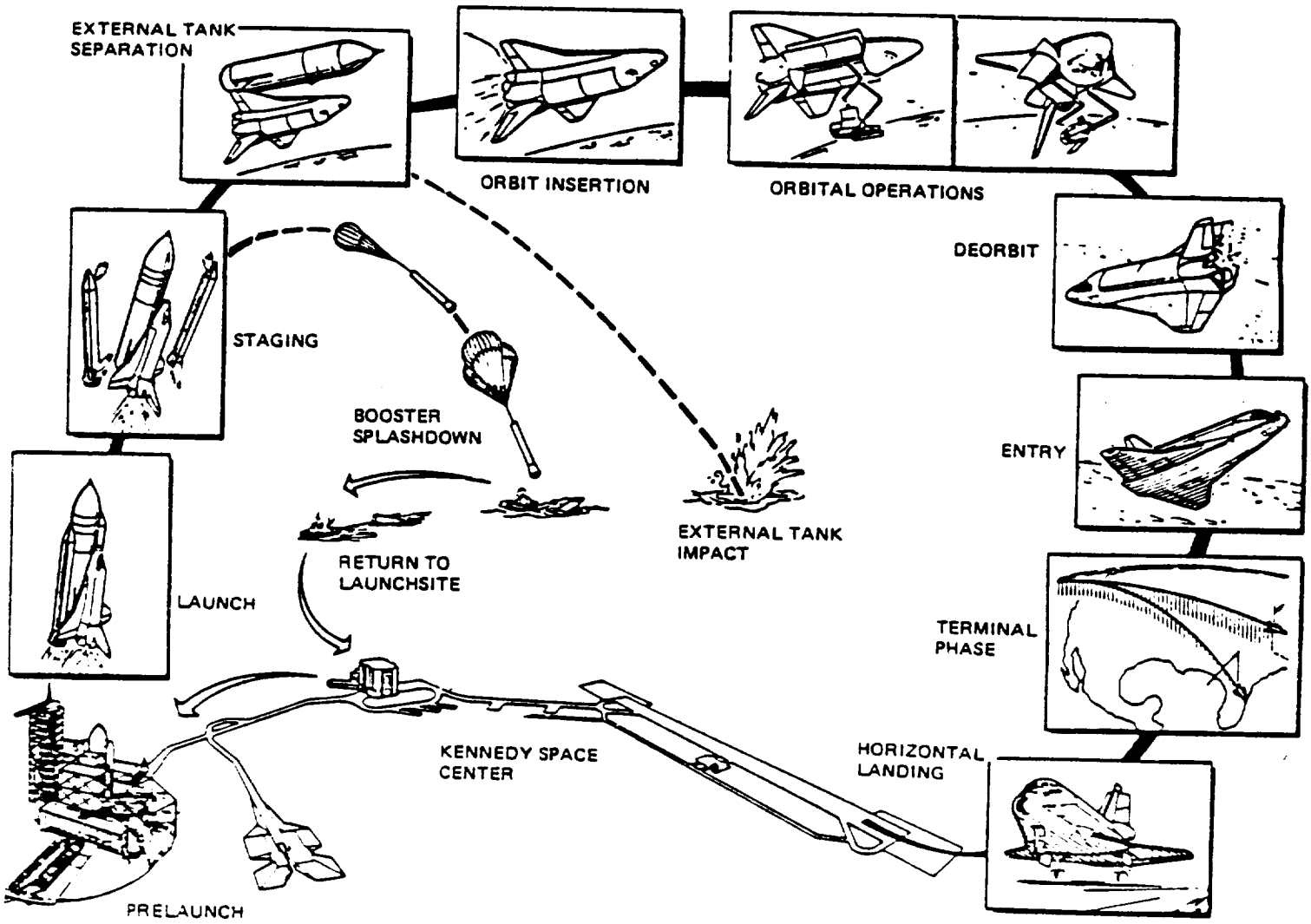
This presentation describes and lists the bidding cost of the major Space Transportation System facilities constructed under the responsibility of the John F. Kennedy Space Center. These facilities and Ground Support Equipment (GSE) are necessary for the receiving, assembly, testing and checkout of the Space Shuttle for launch and landing missions at KSC. The Shuttle launch configuration consists of the Orbiter, the External Tank and the Solid Rocket Boosters (SRB). The reusable Orbiter and SRB's is the major factor in the program that will result in lowering space travel costs. The new facilities are the Landing Facility; Orbiter Processing Facility; Orbiter Approach and Landing Test Facility (Dryden Test Center, California); Orbiter Mating Devices; Sound Suppression Water System, and Emergency Power System for LC-39. Also, a major factor was to use as much Apollo facilities and hardware as possible to reduce the facilities cost. The alterations to existing Apollo facilities are the VAB modifications; Mobile Launcher Platforms; Launch Complex 39 Pads A and B (which includes a new concept - the Rotary Service Structure), which was featured in ENR, February 3, 1977, "Hinged Space Truss will Support Shuttle Cargo Room;" Launch Control Center mods; External Tank and SRB Processing and Storage; Fluid Test Complex mods; O&C Spacelab mods; Shuttle mods for Parachute Facility; SRB Recovery and Disassembly Facility at Hangar "AF" and an interesting GSE item - the SRB Dewatering Nozzle Plug Sets (Remote Controlled Submarine System) used to inspect and acquire for reuse of SRBs.

Some of the other interesting aspects are: Twenty percent of the subcontract work was performed by Minority Business contractors and suppliers. These total facility construction projects are successfully meeting its time schedule and dollar requirements with present bidding cost totaling $141,303,650 with approximately 75% awarded and under construction, and of which over 90% is completed.

These Shuttle facilities will be used to process, launch and recover elements of a Space Transportation System which will assure the United States continued pre-eminence in space exploration and development. The Shuttle will reduce the cost and increase the effectiveness of using space for commercial, scientific and defense needs.

BACKGROUND

SPACE SHUTTLE MISSION PROFILE



These Shuttle projects have been divided into seven different areas. The first area is the Orbiter Landing Facility (renamed the Shuttle Landing Facility (SLF) was bid March 8, 1974 and completed May 12, 1976. It was the first major Shuttle construction project. The successful bid of $21,812,737 was submitted by Morrison-Knudsen Company of Darien, Connecticut. See Exhibit "I." This was bid during the 1974 energy crunch when energy availability and cost escalation were a big concern of the bidders. It is interesting to note a unit price was used for the 2,726,550 cubic yards of unclassified excavation due to the variation in estimating excavation. This helped NASA/KSC eliminate the contractor contingencies for variations in quantity in bidding the job and provided the Government a strong basis for negotiating additional excavation if an unforeseen site condition warranted it. The low bidder was so successful in planning and scheduling of materials and equipment and the actual construction that the job was completed 6 months ahead of schedule and the cost growth during construction due to design deficiencies was less than one-tenth of one percent (0.05%) and there were no claims for additional cost or time. See the enclosed Abstract of Bids for variations in unit prices and total bids. Item #1 was the unit cost for excavation and Item #2 was the lump sum cost for the balance of the work. The low bidder was declared nonresponsive because of an error in the amended quantity. Their superintendent confirmed that this was a profitable job for them. This would be another story for "How Does the Successful Low Bidder get low and Make Money."

The second phase of this facility was bid March 28, 1975 with Reinholt Construction Company of Rockledge, Florida, the low bidder with $2,376,400. (See Exhibit II for Scope and Description). The third part was Phase IIA bid March 10, 1977 with a low bid of $1,733,000 by Beckman Construction Co. of Fort Worth, Texas. This part consisted of the Orbiter Mate-Demate Device with 224.5 tons of structural steel reaching 100 feet to remove the Orbiter from on top a "Boeing 747," sitework foundations,

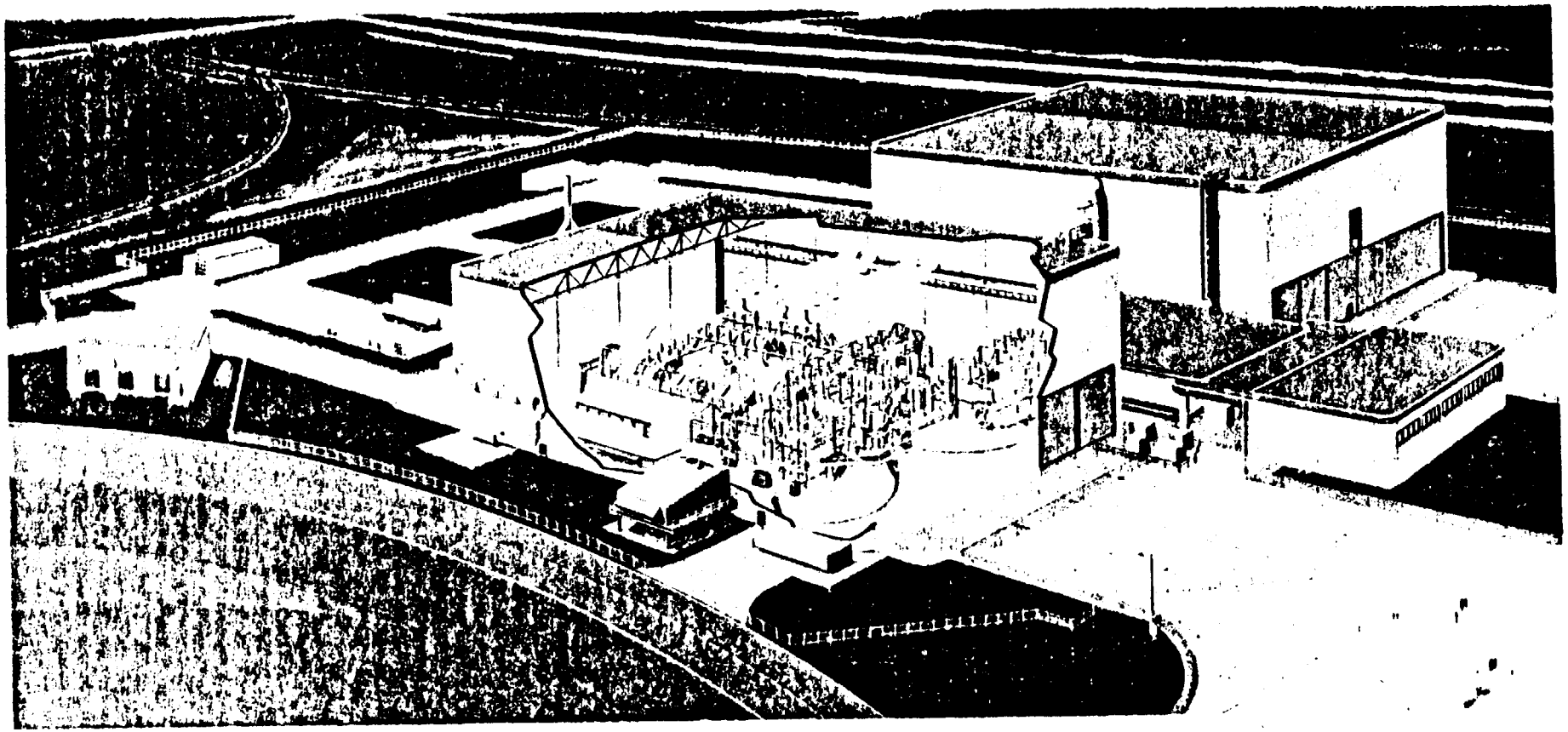
electrical power and lighting for the three 50-ton hoist system (See Exhibit III, TR-1508, page 120) System Summary as discussed in "KSC Estimating Format for Construction Management."

The three SLF projects bid totals $25,922,137. This area was complete ahead of schedule June 17, 1978 with the first scheduled landing of the B-747 and Piggyback Orbiter anticipated for early 1979.

The second area is the Orbiter Processing Facility (OPF) divided into six separate bid packages (See cutaway section of OPF). The OPF is where the Orbiter will be processed for checkout and refurbishment after it arrives from Rockwell initially and after return from space. Package I was bid May 14, 1975. The low bid was $8,733,200 by Frank Briscoe Company, Inc. of East Orange, New Jersey. (See Exhibit IV for scope, description). This project was complete April 25, 1977. Package II for two 30-ton 141-foot span and 76-foot lift bridge cranes was bid May 28, 1975 for $855,924. The low bidder was Fulton Shipyard of Antioc, California. The cost per ton of lift is $14,265. Package IV for two additional cranes for High Bay #2 of January 7, 1977 was the same price. Package III for the Orbiter Access Platforms (OAP) piping and cabling in High Bay #1 was bid June 11, 1976 for $3,452,000, with Mayfair Construction Company of Chicago, Illinois the low bidder. Package V for High Bay #2 was bid May 14, 1976 with the low bidder again Frank Briscoe with $3,926,600; (See Exhibit V) System Summary of Government estimate, showing bidders, bids and building square foot cost of $134.68. Package VII for High Bay #2, Task I, OAP; Task II, Piping, Cabling and Equipment; and Task III, a 10,200 SF Support Annex. (See Exhibits VI, VII and VIII for bid breakdowns and scope and descriptions). The low bidder was Beckman Construction Company of Ft. Worth, Texas with $3,116,000. The OPF totals are $20,939,748 with a completion in January 1979.

ORBITER PROCESSING FACILITY

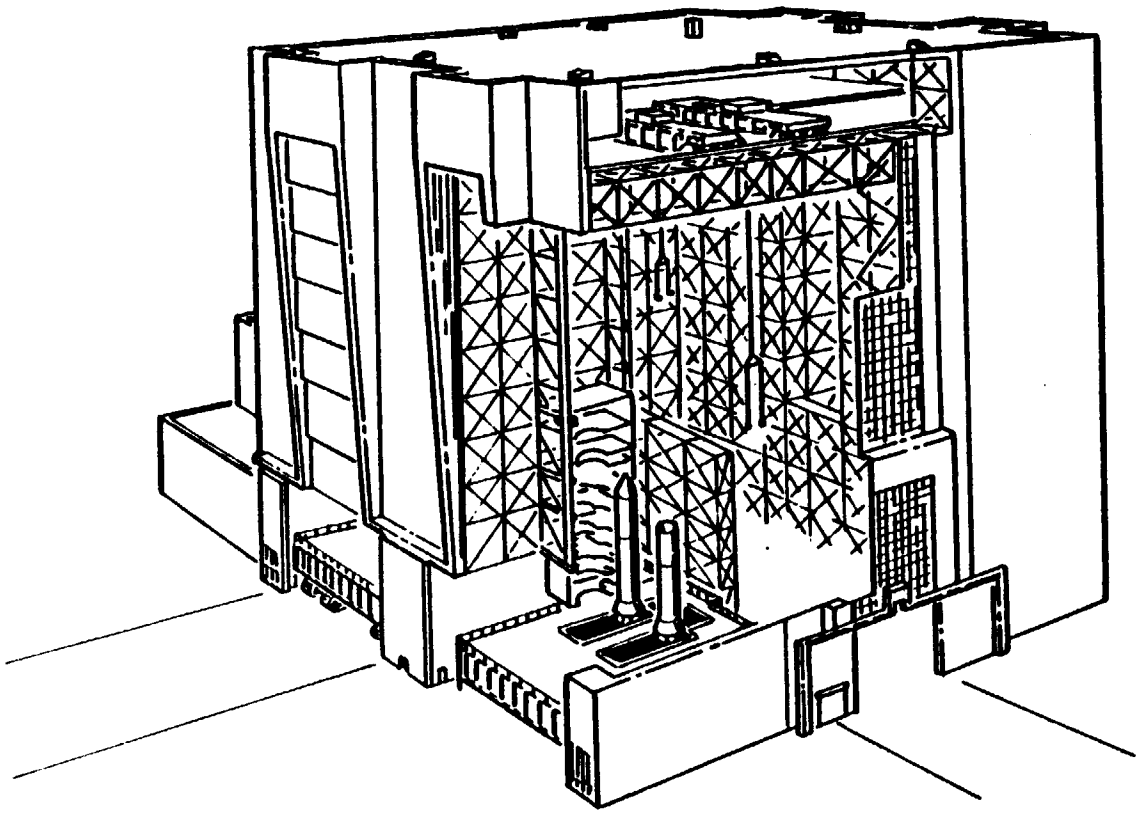
CUTAWAY SECTION



The third area is the VAB and LCC consisting of eight VAB contracts and three LCC contracts for alteration, modification and additions to the existing Apollo facilities. (See SRB Stacking & Mating VAB). The VAB or Vehicle Assembly Building was the largest volume building in the world at the time of construction in 1963-1967.

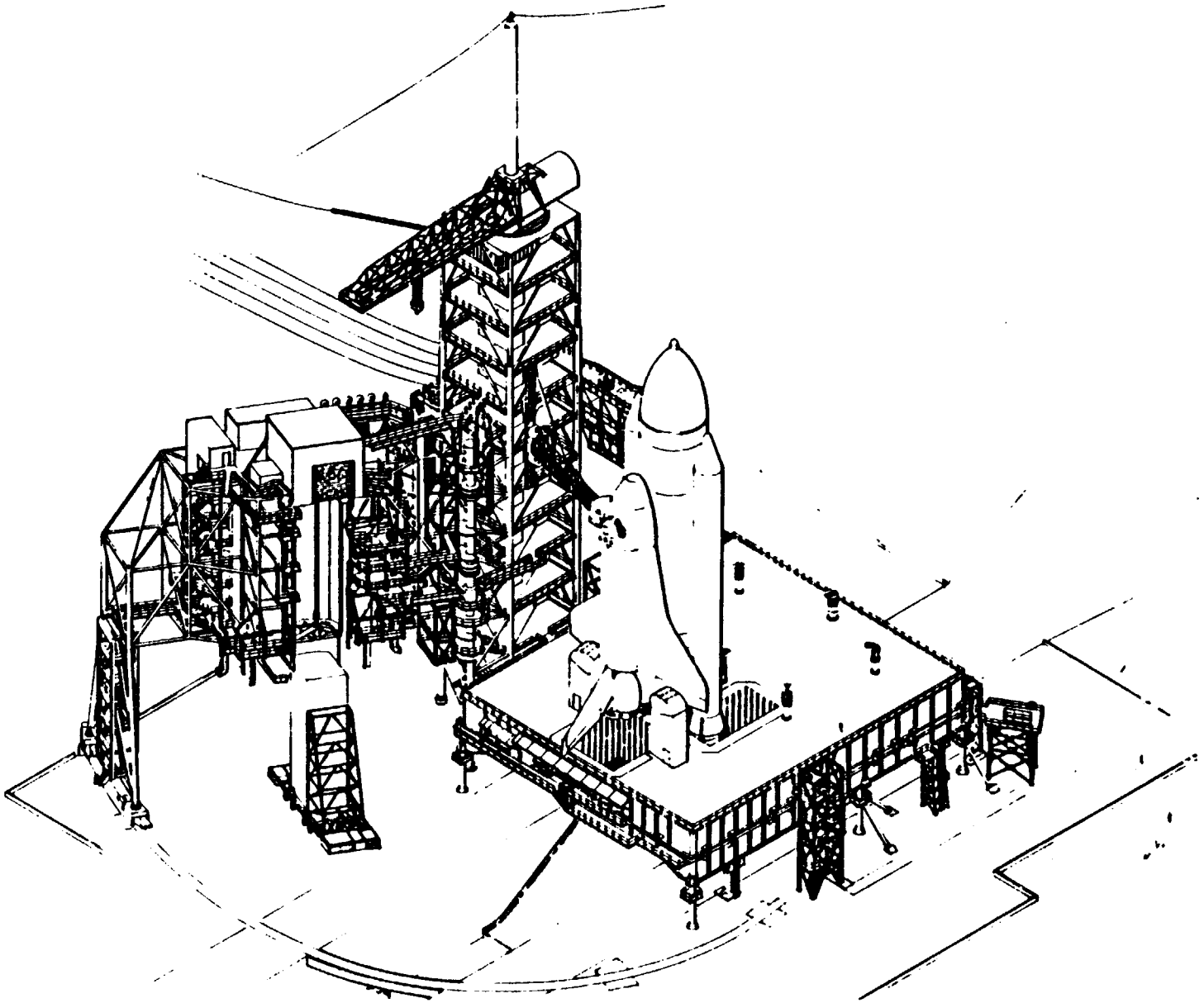
The first contract for Shuttle modification bid June 5, 1975 with a low bid of $5,137,827 by Mayfair Construction Company (See Exhibit IX). The A-2 mods bid October 7, 1977, with a low bid of $5,745,000 by Frank Briscoe. The B-1 mods were bid August 18, 1976 for External Tanks and SRB Processing and Storage mods for $2,537,000. Frank Briscoe was again the low bidder. The B-2 portion was for two 125-ton bridge cranes for $385,450 or $1542 per ton from Crane Hoist Engineering Company (HECO) of Downey, California awarded August 20, 1976. The C portion of High Bay #3 system and platform mods was bid November 12, 1976 for $874,000 with Frank Briscoe again the low bidder. The D-1 portion for SRB Refurbish and Subassembly Low Bay was bid December 15, 1976, however, Holloway Construction of Titusville, Florida was the low bidder with $1,300,000. The D-2 portion was furnished by HECO for $275,000. The D-3 portion to be provided later under Flow 2. Therefore the VAB total for Shuttle mods is $16,254,277 with projected completion date early 1979/ The Launch Control Center (LCC) alterations and modifications consisted of three packages - the first package was bid November 19, 1975 for $939,900 for alteration of the Firing Room from Apollo to Shuttle configuration, etc. The low bidder was Holloway Construction Company. Package #2 was also awarded to Holloway for $222,800. The 2-A Package was bid November 3, 1976. It was for three each 400 KVA Static Inverter Units for Uninterruptible Power Supply System which was bid by Teledyne Inet of Gardian, California for $399,700, with a completion date of November 1978. The LCC total is $1,562,300. Therefore, the third area total for the VAB and LCC is $17,816,577

SRB STACKING/MATING
(VAB)



- INTEGRATION
- SRB STACKING
- ET MATE
- ORBITER MATE
- TRANSFER TO PAD

The fourth area is for LC-39 Pad A, Pad B and the Mobile Launcher Platforms (MLP) #1, #2 and #3. (See Payload Canister being loaded into PCR with Shuttle MLP for Pad overview). The LC-39 Pad A and Mobile Launcher was bid June 25, 1975 with Blount Brothers of Montgomery, Alabama the low bidder with $18,749,000. For ease of tracking, this was separated into $12,449,000 for Pad A and $6,300,000 for Mobile Launcher Platform #1, Package 1 (See Exhibit X). One of the major parts of this project was the disassembly of the 446 foot high Apollo Launcher Umbilical Tower and a steel ship-like platform. The platform became MLP #1 and part of the tower being mounted permanently on the Launch Pad and part hauled to the KSC Industrial Area 5 miles south to the Launch Equipment Test Facility (LETF). The low bidder was successful in disassembly and moving it in large sections. His economically efficient method was probably a major reason for his successful low bid. A color picture of this success was featured on the front cover of Engineering News Record (ENR), February 3, 1977. This again proved, as mentioned in "How Does the Successful Low Bidder Get Low and Make Money??," "the low bidder can successfully complete the job through ingenuity, hard work, efficient management, creativity, good labor productivity, imaginitive engineering ability to see beyond the adding up of numbers to actually effect their selection to be successful. The selection of the most efficient method by imagination and ingenuity is one of the most important ingredients for successful construction at a profit." Another major part of the Pad A portion was a new design concept - that of the Hinged Space Truss to rotate and support the Payload Changeout Room (PCR). This was also featured in the ENR backup story "Hinge Space Truss will Support Shuttle Cargo Room." This design concept allows the payloads (cargoes, satellites, spacelab, etc.) to be checked out and/or installed on the launch pad in the vertical position .



PAYLOAD CANISTER BEING LOADED INTO PCR

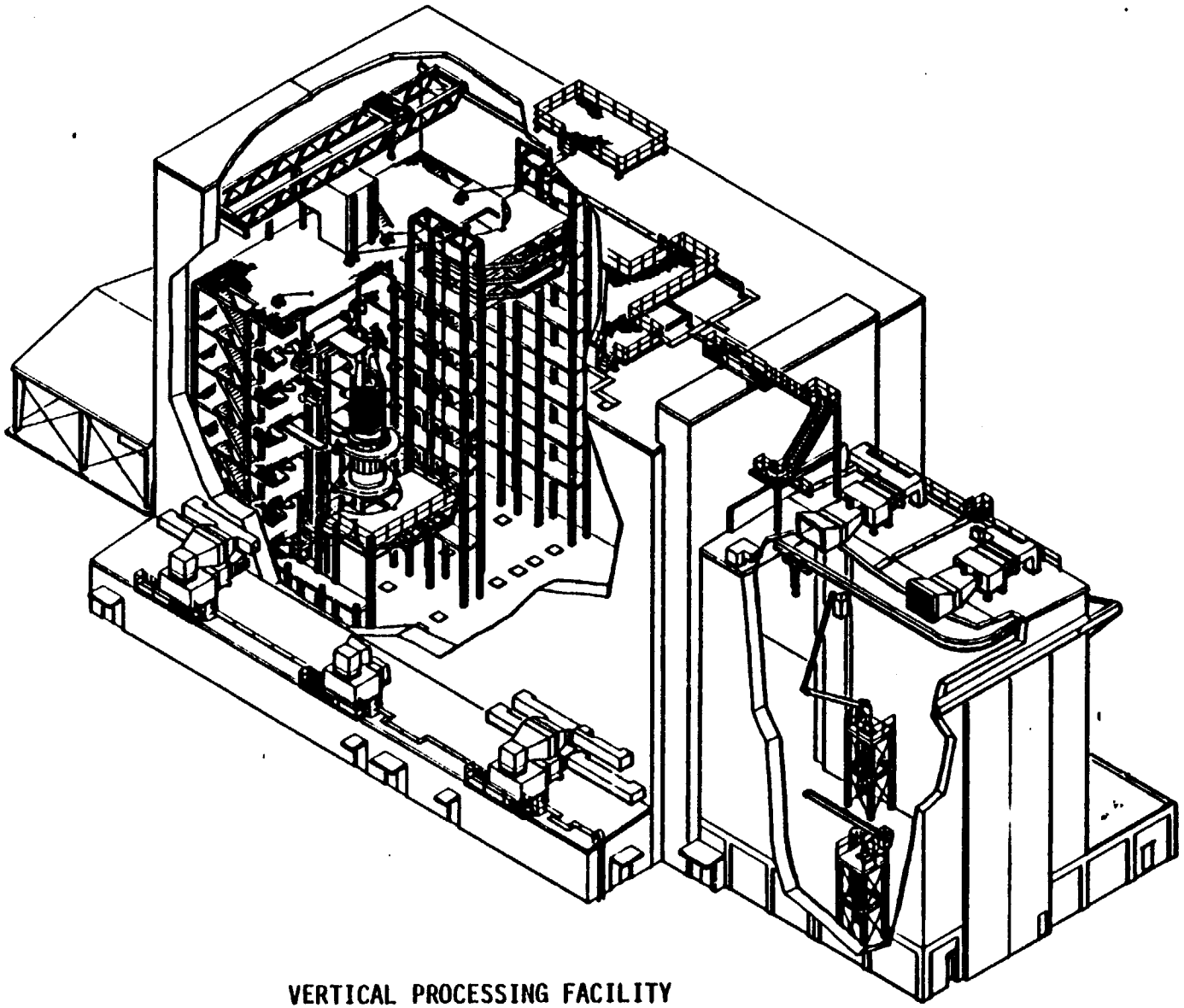
Other work on the Pad were changes necessary to modify the Pad to the Shuttle configuration from the Apollo-type launch pad. The Shuttle will use two Solid Rocket Boosters in addition to the liquid fuel - hydrogen and oxygen. The fuel for the Apollo/Skylab launches were kerosene and liquid oxygen. These solids also required major changes in the MLP. The large flame hole for the Apollo was eliminated and three additional flame holes were provided for the Orbiter engines and for the two SRB engines. This was part of "Recycle of Existing Facilities Design Philosophy to use Existing Facility when Possible." Other major use of existing facilities was in the VAB, at the KSC Industrial and at Cape Canaveral Air Force Station. The Pad A and MLP #1 was the second largest bid contract for KSC Shuttle construction. It was completed February 28, 1978. Package 1A for Pad Integrated Shuttle Piping and Cabling (Vol. I and II) was bid September 1, 1976, with Algernon Blair of Atlanta, Georgia submitting a low bid of $1,103,000. Package 2 for Pad Integrated Additional Facilities Alterations for Piping & Cabling (Vol. III and IV) was bid December 10, 1976, with Blount Brothers Construction again the low bidder with $5,000,000 bid. The bids ranged to $5,995,321 with a Government estimate of $5,369,535. Package 2A for Sound Suppression mods to Water Supply System, Electrical Controls and Side Flame Deflectors, was bid March 16, 1977, with a low bid of $4,334,000 by Algernon Blair. This is a new system used to deaden the sound waves to reduce the sonic hazard to the crew and payloads during the first few seconds of engine firing by spraying 300,000 gallons of water at the right elevation to absorb the excess sound energy but yet not cause any loss of uplift or power. This brings the Pad A total to $22,886,000 Pad B Shuttle mods for Pad Alterations, Piling, and Sound Suppression was bid June 30, 1978 with Frank Briscoe's low bid of $17,195,000. (See Exhibit XI). This is scheduled for completion September 14, 1979. The Payload Changeout Room or Rotary Service Structure (RSS) as it has been renamed, portion is under design now with scheduled construction in the early 80's. The integrated Pad Piping and Cabling and Equipment is also under design with a similar construction schedule.

The MLP #1 Package I structural mods, as noted before, was bid for $6,300,000. Package II for Mechanical and Electrical was bid February 16, 1977 for $2,799,713 with Mayfair Construction Co. the low bidder. Deck modifications (structural reinforcement was bid by Industrial Steel of Mims, Florida for $99,424. Ivey Steel Erectors of Merritt Island was the low bidder for additional reinforcement, which was bid October 27, 1978 with a low bid of $257,050. This brings the total for MLP #1 to $9,456,187. The MLP #2 basic structural and sound suppression mods was bid June 10, 1977 with Algernon Blair the low bidder with $7,325,000. The high bidder was $9,647,934. Package 2 for Mechanical and Electrical installation and Blast Deck Reinforcement was bid June 15, 1978 with Algernon Blair again the low bidder for $2,021,000. The Government estimate was $2,209,401. (See Exhibit XII for system breakdown and bid abstract). Therefore the total for MLP #2 is $9,346,000 with scheduled completion September 1979.

MLP #3 is scheduled for design and construction during the 1980's. The present totals for our fourth area, including Pads A and B and MLP's #1 and #2, is $58,883,187.

The fifth area is the KSC Industrial Area and CCAFS, including the Hypergolic Maintenance Facility (HMF), LETF, Emergency Power, Parachute Facility, O&C Spacelab, and Vertical Processing Facility (VPF), etc.

The LETF was bid November 14, 1975 with W&J of Cocoa, Florida low bidder for $467,200. This included assembly and alteration of the restructured tower from the ML. Also included was the architectural/structural, electrical and mechanical alterations for control of the equipment testing. The nearby Fluid Test Complex (renamed HMF), Package I Shuttle mods, was bid March 5, 1976 for $860,800 with Fulford Construction Company of Indian Harbor Beach, Florida the low bidder. The HMF Package II was bid November 17, 1976 for $1,395,165 with Mayfair the low bidder. The Shuttle mods for Parachute Facility, also in the Industrial Area, was bid September 15, 1977 for $1,608,750 with Holloway Corp. the low bidder. Monorail cost reductions



VERTICAL PROCESSING FACILITY

reduced this bid by $101,500 after award. The Operations & Checkout (O&C) Spacelab Shuttle mods were bid July 15, 1977 for $1,798,000 with a tie bid between Holloway and W&J. The contract was subsequently awarded to W&J by mutual agreement and luck of the draw of straws with the longest straw winning the bid. The Viking Sterilization and Encapsulation Facility (renamed Vertical Processing Facility) Package was bid April 26, 1978. (See Isometric of VPF Platforms and Airlock). The low bid of $3,034,115 by Mayfair was nonresponsive because of integrity because of previous false submittal data and was awarded to the second bidder, W&J, for $3,119,000. The scheduled completion is April 21, 1979. Package II (Phase IIA and B) was bid October 20, 1978 for $1,949,700 with W&J the low bidder (See Exhibit XIII for bids and scope). The SRB Recovery and Disassembly Facility at Hangar AF, which is across the Banana River at Cape Canaberal Air Force Station, was bid October 13, 1977. The low bid of $3,158,800 by Capitol Communication Corp. of Milwaukee, Wisconsin was declared nonresponsive because they were not a small business because of affiliation with Mayfair, a big business, since this was a small business set-aside. Therefore, this was awarded to the second bidder, Holloway, for $3,227,300. It is scheduled for completion early 1979. This project consists of mods to Hangar AF and heavy paving, 9950 SF of prestressed sheet piling, dock-bulkhead, 3400 LF of RR track, large turntable, high pressure cleaning facility, 1000 KVA electrical system with scheduled completion February 1979. The maintenance dredging of the channel was completed by the Corps of Engineers September 10, 1978 for $1,368,675. The LC-39 Emergency Power System was bid September 2, 1977 for $1,177,000 with W&J the low bidder. The Government estimare was a close $1,134,183. This was for the installation of five GFE 1000 KVA diesel engines generators (in a 5500 SF building @ $94.00/SF) including controls, transformers, switching and power lines with completion November 1978.

Other miscellaneous facilities construction were:

Fencing for PAACS	$ 73,943	High Purity O_2 Facility	$154,546
Locomotive Maint. Fac.	24,287	Pad A Cooling Tower	91,980
Thermal Protection Sys. Fac.	29,000	Integrated Test Stands O&C Bldg.	185,465
Pad Environmental Control System Mods	61,800	SRB Hypergolic Pumping Units Hot Fire	54,994
HMF Heating Plant	285,900	Supple. Mods to LC-39A	609,384
Shore Power, MLP, Pad	59,912	Mods to Swing Gate OPF HB #1	82,563
Ammonia Syst. -(OPF HB)	35,460		

The total for the fifth area is $17,742,001.

In summary, the KSC Shuttle facility construction bid costs for the five areas are:

Shuttle Landing Facility	$ 25,922,137
Orbiter Processing Facility	20,939,748
VAB and LCC	17,816,577
Pads A, B, MLP #1 and MLP #2	58,883,187
KSC Industrial Area, etc.	17,742,001
Total	$141,303,650

Therefore, with present bidding cost of $141,303,650, and approximately 75% awarded and under construction and of which over 90% is completed, KSC is successfully meeting our time schedule and dollar requirements. Other major projects to be scheduled to build are Pad B RSS, Piping Cabling and Equipment and MLP #3, which are scheduled for the early 80's. An interesting aspect is that 20% of the subcontract work was performed by Minority Business Contractors and suppliers. (See Exhibit XVI for Pad B Information for Bid - IFB 10-0089-8 bid para. Article 8, pages 71 and 72).

The sixth area is the Shuttle construction work at the Dryden Test Flight Center, California (formerly Edwards Air Force Base) was also under the responsibility of KSC. This included the following major projects: The Orbiter Approach and Landing (ALT) Facility which was bid May 16, 1975 with Santa Fe Engineering Co. the low bidder, with $3,567,567 (See Exhibit XIV for scope and description). The second project for the fabrication and erection of the Orbiter Mating Device (OMD) was bid November 12, 1975 with George A. Fuller of Santa Monica, California the low bidder

at $2,199,000. This was for two OMD's, however, only one was purchased at that time. The option for the second one was not exercised. The bid for one was $1,279,000. Other bid projects were the Hypergolic Fuel and Oxidizer Area bid on March 17, 1976 by C. A. Rasmussen, Inc. the low bidder for $142,456. Also bid the same day was ALT Office Complex for $219,500 with the Stevens Co. the low bidder. The Orbiter Access Platforms was bid October 12, 1976 and the low bidder was Modern Development Co., Baker Field, for $255,330. Therefore, the total for the Dryden work was $5,463,853. This was completed on schedule and was used successfully with the flight testing of the Orbiter/747 piggyback which had major TV coverage.

The seventh area is some of the other major Shuttle projects bid such as the Ground Support Equipment (GSE) and miscellaneous items. Some of the interesting bids were:

1. Procure, manufacture, fabricate and furnish 21 Pneumatic Control Panels, bid August 12, 1976, for $1,199,610 with Chrysler the low bidder. These panels were bid at an average cost of $57,124.

2. SRB Holddown Posts, 20 each, bid April 28, 1977, for $461,059 with Zierden Co. of Oak Creek, Wisconsin the low bidder.

3. Tail Service Masts for LOX and LH_2 was bid May 20, 1977. Belko Steel of Orlando, Florida was low with $696,410. The Government estimate was $664,862. (See Exhibit XV).

4. The Utility Control System, Phase IIA, was bid August 23, 1977, for $789,907. Mayfair Construction Co. was low.

5. Mods to High Temperature Hot Water System was bid September 7, 1977 for $769,600 with Harper Plumbing Co. of Orlando, Florida the low bidder.

6. The Orbiter Payload Canister was bid April 27, 1978 by Belko Steel Co. for $1,311,510, with the Government estimate of $1,243,557.

7. Case Segment Dollies and Hoisting Slings was bid June 6, 1978 for $985,805 with Marmon Transmotive, Knoxville, Tenn. the successful low bidder. The low bidder was BENCON of Indian Harbor Beach, with $967,715, however, he was disqualified for lack of adequate manufacturing plant.

8. The SRB Dewatering Nozzle Plug Set (Remote Controlled TV Submarine System) used to inspect and acquire the SRB's for reuse after down-range splashdown, was bid February 25, 1978. The low bidder of six bids received (ranged to $4,551,226) was $1,495,551 by International Hydro-Dynamics LTD, Canada. The Government estimate was $1,519,557. This included options for additional nozzle plug sets which were not exercised. The contract was awarded for $1,022,314.12.
These total $7,236,215.

In summary, the bid total of the above projects is:

a.	KSC Construction Bids	$141,303,650
b.	Dryden Flight Center	5,463,853
c.	GSE and Miscellaneous	7,236,215
	Total	$154,003,718

It is interesting to note that the low bidders were from all over the USA and one from Canada and many are nationally known contractors and companies. Many were local contractors.

These Shuttle facilities will be used to process, launch and recover elements of a Space Transportation System which will assure the United Stated continued preeminence in space exploration and development. The Shuttle will reduce the cost and increase the effectiveness of using space for commercial, scientific and defense needs.

On October 1, 1978, when President Carter was at KSC's VAB to help NASA celebrate its 20th Anniversary, and on his birthday, he said "We will take our next step into

space with the first flight of the Space Shuttle, which I sincerely hope will be before my next birthday, and in the last analysis the challenge of space takes us very close to the heart of things. It brings us face-to-face with the mysteries of creation of matter, of energy, of life itself."

And so in conclusion, KSC Space Center construction is here and now "The Launch Facilities that sent men to the moon a decade ago and are now littered with construction equipment and hard hat construction workers. The hard hats are preparing KSC for the first construction workers wearing Space Helmets," as pointed out in December 1978 McGraw Hill's "Construction Contracting" and they went on to say: "SPACE-AGE construction is here!" "The Shuttle will carry the first experiments of space manufacturing; then as early as 1982 the first piece of space construction equipment will be tested to prepare for the building of space projects in the 1990's;" "U.S. business are gearing up for work in space for a profit. Experiments in space manufacturing are underway and the first piece of space construction equipment has already been built."[7]

REFERENCES:

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2., Brown, Joseph A. "KSC Cost Index for Construction Management," presented at the 19th Annual AACE Meeting, Orlando, Florida, June 29-July 2, 1975.

3. Brown, Joseph A. "How Does the Successful Low Bidder Get Low - and Make Money??," presented at the 17th Annual Meeting, St. Louis, Missouri, June 17-20, 1973.

4. Brown, Joseph A. "KSC Estimating Format for Construction Management," presented at the AACE 21st Annual Meeting in Milwaukee, Wisconsin, June 26-29, 1977.

5. Brown, Joseph A. "Launch Pad to the Moon - Construction Bidding Cost of Launch Complex 39," presented at the 12th Annual AACE Meeting in Houston, TX, June 17-19, 1968.

6. KSC Technical Report (TR-1508) Budget Cost Data for Facilities Construction Elements Revised October 12, 1978.

7. NASA Activities, November 1978, Volume 9, No. 11.

8. Space Transportation System - Facilities & Operations KSC - K STS MO-1, Appendix A.

9. KSC/DD-FED Abstract of Construction Bid Costs, January 1, 1974, to October 31, 1978, dated November 3, 1978.

10. McGraw-Hill's Engineering News Record, February 3, 1977; "Space Truss to Support Cargo Room."

11. KSC Construction Contract Completion Dates, December 1, 1978.

12. McGraw-Hill's Construction Contracting, December 1978; "Space Age Construction is Here."

TASK I - CONSTRUCTION SPACE SHUTTLE LANDING FACILITY - KSC, FLORIDA PCN 75892

IFB No. CC 10-0033-4 Issued 1-10-74 Opened 3-8-74

BIDDER	2,726,550 Cu. Yds. 1-UNIT	JOB 1-ESTIMATE	JOB 2-ESTIMATE	TOTAL
* Granite Construction Co. Watsonville, CA	0.75	$1,700,775.00 [2,044,912.50]	$19,568,000.00	$21,568,775.00 [21,912,912.50]
Morrison-Knudsen Co. Inc. Darien, Conn	0.80	2,181,240.00	19,631,497.00	21,812,737.00
Western Contracting, Corp Sioux City, Iowa	1.00	2,726,550.00	19,173,450.00	21,900,000.00
S.B. McCormick & Sons, Inc. Jacksonville, FL	1.35	3,680,842.50	20,306,050.00	23,986,892.50
Claussen Paving Co. Augusta, GA	1.60	4,362,480.00	20,537,000.00	24,899,480.00
Government Estimate	.86	2,344,833.00	22,756,047.00	25,100,880.00
Wiley N. Jackson, Co. Roanoke, VA	1.00	2,726,550.00	23,120,116.00	25,846,666.00
Kiewit-Zachary Joint Venture Cleveland, OH	1.00	2,726,550.00	23,915,000.00	26,641,550.00
Wright Contracting Co & Southern Road Builders Joint Venture Columbus GA & Augusta GA	1.05	2,862,825.00	24,600,000.00	27,462,825.00
C. W. Matthews Constr. Co.Inc. Marietta, GA	1.00	2,726,550.00	24,895,057.00	27,621,607.00
Hubbard-Smith Joint Venture Orlando, FL	1.28	3,489,984.00	25,338,332.00	28,828,316.00
Excavation Construction, Inc. Bladensburg, MD	4.16	9,433,632.00 [11,342,448.50]	19,666,368.00	29,100,000.00 31,005,816.50
Macomb Concrete Corp. Fraser, MI	1.25	3,408,125.00	26,000,000.00	29,408,125.00

* Error unit price based on initial quantity of 2,267,700 cy unclassified excavation.

DESCRIPTION:

The work consists of the construction of: (1) a 15,000 foot by 300 foot wide, 16" & 15" thick concrete runway with a 1,000 foot overrun at each end to include approach, touchdown, high intensity runway edge, taxiway and centerline lights; (2) a 30,000 square yard parking apron; (3) a 9,150 foot taxiway from the runway to the vicinity of the Vehicle Assembly Building (VAB); (4) a 650 foot taxiway from the taxiway to the apron; (5) drainage systems; (6) approximately 1.5 miles of access roads; (7) electrical distribution system with associated cabling, switches, transformers, fixtures, and other equipment required to support the lighting systems; (8) airfield lighting vault; (9) water distribution system including approximately 7,000 feet of 12-inch water line and other miscellaneous piping, and (10) such other work as required to provide a complete facility in accordance with the plans and specifications.

EXHIBIT I

CONSTRUCTION - SPACE SHUTTLE LANDING FACILITY PHASE II - PCN 77120

IFB No. 10-0027-5 Issued 2/14/75 - Bid 3/28/75

BIDDER	Total
1. Reinhold Construction Co., Rockledge, Fla	$2,376,400
2. Continental Consolidated Corp. Pompano Beach, Fla	2,420,000
3. Frank Briscoe Construction Co, East Orange, New Jersey	2,493,255
4. Mamba Engineering Co., Titusville, Fla (Electrical Sub-Contracting Phase I)	2,548,988
5. Butler & Oenbrink Rockledge, Fla	2,560,000
6. Capital Communication Corp Milwaukee, Wisc.	2,850,375
7. Gibson Electric Inc. Tipton, Ga	2,896,000
Average of 7 Bidders	2,592,745
Government Estimate	2,584,993

THE WORK CONSISTS OF THE CONSTRUCTION OF:

A 4500 SQUARE FOOT MASONRY BUILDING, LANDING AIDS CONTROL BUILDING (LACB), LOCATED NEAR THE EAST EDGE OF THE PARKING APRON EQUIPPED WITH AIR CONDITIONING AND RAISED FLOORS FOR COOLING AND ROUTING OF CABLES TO THE ELECTRONIC EQUIPMENT.

ORBITER LANDING INSTRUMENTATION FACILITIES TO INCLUDE FOUR MICROWAVE SCANNING BEAM LANDING SYSTEM (MSBLS) SHELTERS APPROXIMATELY 280 SQUARE FEET, ONE TACAN SYSTEM SHELTER OF APPROXIMATELY 400 SQUARE FEET, TWO OPERATIONAL TELEVISION TOWERS (OTV) APPROXIMATELY 70 FEET HIGH, AND ONE METEOROLOGICAL SITE CONSISTING OF A PAD AREA AND STANCHION FOR EQUIPMENT.

OUTSIDE COMMUNICATIONS PLANT CABLING TO PROVIDE HARDWARE CIRCUITS INSTRUMENTATION AND COMMUNICATION SYSTEMS AND EQUIPMENT THROUGHOUT THE LANDING FACILITY. (41850 L.F. of Cable with 12975 L.F. of 36-16 + 3X19 OTA).

UTILITY SYSTEMS INCLUDING AN ELECTRICAL POWER DISTRIBUTION SYSTEM TO THE VARIOUS LANDING AID FACILITIES WITH CONCRETE ENCASED DUCT BANKS AND DIRECT BURIAL CABLE. A WATER DISTRIBUTION SYSTEM TO PROVIDE WATER FOR FIRE, DOMESTIC AND INDUSTRAIL USE, AND A 1500-GALLON PER DAY ACTIVATED SLUDGE SEWAGE TREATMENT PLANT TO SERVICE THE LACB.

EXHIBIT II

TASK I - CONSTRUCTION COMPLETE OF THE ORBITER PROCESSING FACILITY-PCN 76389, KSC,FLA

IFB #CC10-0028-5 ISSUED 3/14/75 BID 5/14/75

BIDDER	TOTAL
Bay-Con General Longwood, Fla	$9,462,000
Butler & Oenbrink Rockledge, Fla	9,199,000
Continental Consolidated Corp Pompano Beach, Fla	9,077,000
Greenhut Construction Co. Pensacola, Fla	9,744,600
J. A. Jones Construction Co Tampa, Fla	9,169,000
McManus, Longe, Brockwell Latham, N. Y.	9,690,000
Morrison-Knudsen, Inc Atlanta, Ga	10,592,000
R&D Constructors,Inc. Parkridge, Ill	9,716,000
Tuttle White Construction, Inc Altamonte Springs, Fla	9,095,000
McCloskey Co., Inc Palm Beach, Fla	9,623,000
Frank Briscoe Co., Inc W. Orange, N. J.	8,733,300
Government Estimate	8,500,128

DESCRIPTION:

The work includes Site Preparation, Construction of 52,800 S.F. Orbiter Processing Facility Phase I, Orbiter Towway & Apron, Parking Lot, Fuel Pads, Water & Sanitary Lines, Storm Drainage & Electrical Duct Banks, Electrical Sub-Station, Underground Catchment Tank & a 3400 S.F. Fire Pump House. Work also includes Chilled Water & High Temperatuee Water Lines, Gaseous Helium, Nitrogen & Compressed Air Systems & other support systems.

The A&E Firm is Seelye Stevenson Value & Knecht, Inc., of New York City.

EXHIBIT IV

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR SYSTEMS

SHEET 4 OF 131

DRAWING NO.: 79K07757 79K08112 | SHEETS: 62 sht. | PCN: I 79596 II 79595 | LOCATION: LC-39 K.S.C. - Runway OLF | PROJECT: ORBITER MATE-DEMATE & MISC. SITEWORK

WORK ORDER/CONTRACT: 1976 | ARCHITECT/ENGINEER: CONNELL-B.R.P.H.-P.R.C. | ESTIMATOR: HANDS-HARRISON PRC | CHECKER: VARNDELL PRC | CODE: C-100 | SUBMITTED: 2/23/77

CONSTRUCTION COSTS

A/S TRADES DIV. TITLE	QTY	UNIT	COSTS $/UNIT	COSTS $/LF	COSTS TOTAL	DIV. TOTAL	SYS. INVOLVED MECH	SYS. INVOLVED ELEC
1. GNL. COND.	N/A							
(%)								
2. SITE						300400		
CLR/GRUB	4.15	ACR	1738		7211			
DEMOLITION								
ERTHWK FILL	5038	CY	19.10		96237			
PILING	2340	LF	30.08		70389			
PAVING	13342	SY	7.63		101749			
UTILITIES	940	LF	19.79		18607			
OTHER	12827	SY	0.48		6207			
3. CONCRETE	N/A							
FMWK								
REBAR								
CONCRETE								
4. MASONRY	N/A							
5. METALS	224.5	TON	2244	1114/LF		503700		
STRUCT STL GFE	139.1	TON	1634		227298			
PLTFMS	6155	SF	31.26		192438			
MISC STAIRS	195	TRD	224		43678			
ACCESS New STL.	20.5	TON	1965		40286			
6. WOOD/PLASTICS	N/A							
7. MOISTURE PROTECT	N/A							
8. DOORS & GLASS	N/A							
9. FINISHES						40662		
PAINTING METAL (GFE)	65500	SF	.60		40662			
OTHER								
10. SPECIALTIES	N/A							
11. EQUIPMENT	N/A							
12. FURNISHINGS	N/A							
13. SPECIAL CONSTR.	N/A							
14. CONVEYING SYS.						571229		
HOISTS	3	EA	87304		261912			
CRANES Tubes	8	EA	28750		230000			
OTHER HYDRA-SET	3	EA	26439		79317			
TOTAL A/S						1415991		

SYSTEMS TRADES DIV. TITLE	PIPING/DUCTING CABLING/CONDUIT SIZES	MATL	QTY	UNIT	COSTS $/UNIT	COSTS TOTAL	COSTS OTHER $	COSTS $/LF	DIV. TOTAL
15. MECHANICAL						14257	14257		14257
A. PLUMBING									
B. HVAC	12000	BTU	1	EA	779	779			779
C. FIRE PROTECT Hose Rack	4"	STL	250	LF	13478	13478			13478
D. HALON									
E. HYPER									
F. CRYO									
G. PNEU									
H. ECS									
I. HYDRAULICS									
J. OTHER									
J1.									
J2.									
J3.									
16. ELECTRICAL						479467	—		479467
A. EXTER SVCS									
B. POWER									
B1. conduit			20083	LF	5.88	118123			
B2. panel, recpt.			315a	EA	45	141770			
B3. cable			94233	LF	1.37	128892			
C. LIGHTING			325	EA	142.15	46197			
D. INSTRUMENTATION									
D1. CABLE/WB/SW/T&C									
D2.									
D3.									
D4.									
E. COMMUNICATIONS									
E1. DIS/PD/PA/TD&SA									
E2.									
F. OTHER GFE							280000		
F1. lightning&fire						8345			
F2.									
F3. Misc.						35840			
TOTAL SYSTEMS						493724	1415991		909714

DESCRIPTION

SCOPE (circle one): 1. FAIR, 2. AVERAGE, 3. GOOD, X. COMPLEX, 5. SOPHIST.

BASIC PLAN (circle one): A. SQUARE, B. RECTANGULAR, D. IRREGULAR, D. VRY IRREG., E.

COMMENTS: 1. LOW BIDDER W&D BETTIS. PRICE IN TUBE ASSY. 2. SPECIAL COND. NOT DELIVER

DESIGN DATA

TYPE FAC. Mate-Demate SF AREA 8556
CAPACITY:
HEIGHT 1o STORIES 100 FT.
STRUCT. FRAME Struc. Steel
VOLUME CF

SPECIAL FEATURES

2nd Mate-Demate Device
1st at Edwards.
GFE:

3-50 ton hoists	$ 198000
str. stl.	106875
elect.	28000
towers	15000
vis. obser. fac.	20000
	$ 619875

CONSTRUCTION BID DATA (IFB 10-0012-7)

MECH. LF: 250	$ .57	/LF	$ 14257	
ELEC. LF: 20083	$ 24	/LF	$ 479467	
SUBTOT LF:	$	/LF	$	
OTHER: struct.	$	/LF	$ 1415991	
SUBTOTAL: $	/BSF	$	/LF	$ 1909714

SPECIAL COST FEATURES

HAZARDS:	$	/LF	$
FAB/TEST/CLN/CERT:	$	/LF	$
GFE:	$	/LF	$
OTHER spec. cond:	$	/LF	$ 148766
SUBTOTAL:	$	/LF	$
TTL PROJ: $ 223	/BSF	$	/LF	$ 2066971

BID DATE 3/10/77
AWARDED TO: Beckman Const. $ 1733000
CONSTRUCT. TIME SPAN: CAL. DAYS 360
NO. OF BIDS 8 GOVT. EST. POS: 5 of 9
PCT DIF. AWARDED BID & GOVT. EST: 16.2%

BIDDERS

Beckman	(L)	$ 1733000
Holloway		$ 1880000
Clifton		$ 1920400
Mayfair		$ 2053300
Govt.		$ 2066971
Jennings		$ 2098800
R&D		$ 2155000
Algernon	(H)	$ 2184000

NSC FORM 21-372 (8/78)

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EXHIBIT III

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR BUILDINGS

SHEET ____ OF ____

DRAWING NO: 79K05766 | SHEETS | PCN: 78152 | LOCATION: LC-39, KSC, FL. | PROJECT: ORBITER PROCESSING FAC. - PHASE II

WORK ORDER/CONTRACT: 1538 | ARCHITECT/ENGINEER: SEELY STEVENSON VALVE & KNETCHT | ESTIMATOR: COPIED FROM OLD EST. - C. CARDONA | CHECKER | CODE: C-100 | SUBMITTED

CONSTRUCTION COSTS

DIV. TITLE	QTY	UNIT	$ UNIT	$ BSF	TOTAL	DIV. TOTAL
1. GNL. COND.						
(%)						
2. SITE WORK	2.2	ACRE	167,275	12.60		368,005
CLR /GRUB	2.2	ACRE	487.73		1,073	
SITE IMPROVEMENT	3,927	CY	13.24		51,981	
ERTHWK /FILL	4,125	CY	3.38		13,942	
PILING	18,330	LF	8.77		160,800	
UTILITIES (S&W)	877	LF	14.89		12,983	
PAVING	1934	SY	44.09		85,262	
OTHER	--	--	--		41,964	
3. CONCRETE	1929	CY	109.80	7.25		211,798
FMWK	16,612	SF	1.71		28,387	
REBAR	153	TON	582.20		89,077	
CON	1929	CY	48.90		94,334	
CEMENT DECKS						
OTHER						
4. MASONRY				.01		323
BLOCK 12"	128	SF	2.52		323	
OTHER						
5. METALS	1,077	TON	1185.61	43.73		1,276,899
STRUC. STL	1,077	TON	1067.07		1,149,236	
JOISTS & DECK						
MISC & ORNAMENTAL	4,705	LF	268		12,635	
GRATING/FRAME	81,910	LB	1.40		115,028	
ITEMS						
6. WOOD/PLASTICS				.03		751
CARPENTRY	2,082	MFBM	.36		751	
7. MOISTURE PROTECT.	29,200			17.35		506,506
WATERPRFNG						
INSULATION	29,200	SF	.61		17,841	
ROOFING	292	SF	72.21		21,084	
SIDING	59,900	SF	6.84		409,717	
DECK	29,200	SF	1.48		43,332	
SHT MTL	2,760	LF	5.27		14,532	
8. DOORS & GLASS				10.39		303,481
DOORS	4	EA	471.50		1,886	
SPECIAL DOORS	4,166	SF	67.16		279,783	
GLASS & GLAZING						
FINISH HARDWARE						
OTHER OH DOOR	394	SF	55.36		21,812	

DIV. TITLE	QTY	UNIT	$/UNIT	$/BSF	TOTAL	DIV. TOTAL
9. FINISHES						
WALL SYS						
FLOOR SYS						
CEILING SYS						
PAINT & COVER	4,700	SF	32		1,511	1,511
OTHER						
10. SPECIALTIES						
11. EQUIPMENT						
SCAFFOLDING				.37	10,829	10,829
12. FURNISHINGS						
13. SPECIAL CONSTR.						
ELEV. FLR. SYS						
OTHER						
14. CONVEYING SYS.						
ELEVS						
CRANES						
HOISTS						
OTHER			TOTAL A/S			2,680,103
15. MECHANICAL	23,200	SF		29.93		874,100
PLUMBING	23,200	SF		1.85	53,886	
FIRE PROTECT.	23,200	SF		4.41	128,742	
VENTILATING						
HEAT & A/C	463	TON	1,493.46	23.68	691,472	
CLN RM (HEPA)						
16. ELECTRICAL				12.96		378,477
LIGHTING	95	EA	365.95		34,675	
CABLE & WIRE	66,060	LF	.60		38,975	
CONDUIT & CABLE TRAY	14,078	LF	3.24		45,613	
DUCT	191	LF	39.08		7,465	
SPCL SYS UNINTER. PWR						
LPS	RECEPT			2.25	65,709	
OTHER						
A&C SPCLZD. CONSTR.						
HYPER SYS						
CRYO. SYS						
PNEU. SYS.						
OTHER						
PROJECT TOTALS						3,932,680

DESCRIPTION

SCOPE (Circle one)	BASIC PLAN (Circle one)	COMMENTS
1. FAIR	A. SQUARE	
2. AVERAGE	(B) RECTANGULAR	
(3) GOOD	C. IRREGULAR	
4. COMPLEX	D. VERY IRREGULAR	
5. SOPHISTICATED	E.	

DESIGN DATA

BLDG. TYPE: METAL STEEL FRAME
CAPACITY: 150 X 195
STRUC. FRAME: N/A
EXTERIOR WALL: METAL
HEIGHT: 9 STORIES: ____ FT.
GROUND FLOOR AREA: 29,200 SF
TOTAL FLOOR AREA: 29,200 SF
VOLUME: 2,774,000 CF
PERCENT AIR CONDITIONED: 100 % 463 TONS
OTHER:

SPECIAL FEATURES

CONSTRUCTION BID DATA (IFB 10-0035-6)

TOTAL BLDG. SF. 29,200

ARCH/STRUC:	$ 91.78	/BSF	$ 2,680,103	
INTERIOR MECH:	$ 29.93	/BSF	$ 874,100	
INTERIOR ELEC:	$ 12.96	/BSF	$ 378,477	
TOTAL INTERIOR:	$	/BSF	$	
TOTAL EXTERIOR:	$	/BSF	$	
TOTAL CONSTR:	$ 134.68	/BSF	$ 3,932,680	
ADDITIONAL: A.	$ AMEND.	/BSF	$ 24,192	
B.	$ SPL COND	BSF	$ 247,716	
TOTAL PROJECT EST:	$	/BSF	$ 4,204,588	

BID DATE: 4-29-76
AWARDED TO FRANK BRISCOE CO. $ 3,926,600
CONSTRUCTION TIME SPAN: -- CALENDAR DAYS
NO. OF BIDDERS: 7 POSITION OF GOVT. EST. 5
PERCENT DIFFERENCE, AWARDED BID AND GOVT. EST. 7%
GOVERNMENT ESTIMATE $4,204,588

BIDDERS

MAYFAIR CONSTR. CO. (L)	$ 3,098,115 (WITHDRAWN)
FRANK BRISCOE CO.	$ 3,926,600
BUTLER & OENBRINK	$ 4,016,000
D.F.S. CONSTR. CO.	$ 4,080,000
FULFORD CONSTR. INC.	$ 4,138,000
D&A EQUIP. CO.	$ 4,224,000
BLOUNT BROS. CORP.	$ 4,330,000
J.A. JONES CONSTR. CO.	$ 4,339,000

NSL FORM 21-471 (9-76)

EXHIBIT V

ABSTRACT OF BIDS

IFB 10-0055-8 of 5/16/78 Bid June 30, 1978
LC-398 Shuttle Modifications, PCNs 81910 and 77113

BIDDER	BASE BID TASK I	TASK II PRECAST PRESTRESSED CONCRETE PILING (12" x 12") 2000 LF		TASK III STEEL FOUNDATION PILES (14" or 16") 44,000 LF		TOTAL
1. Algernon Blair Atlanta, GA	$16,229,000	$14.00/LF	$28,000	$27.00	$1,188,000	$17,445,000
2. Blount Brothers Corp. Montgomery, ALA	$16,599,000	$14.00/LF	$28,000	$24.00	$1,056,000	$17,683,000
3. Frank Briscoe Co. Inc. East Orange, NJ	$16,157,000	$13.00/LF	$26,000	$23.00	$1,012,000	$17,195,000
4. Mayfair Construction Co Chicago, ILL	$16,261,754	$17.00/LF	$34,000	$25.00	$1,100,000	$17,396,000
5. Titan Southeast Constr. Corp., Miami, FL	$16,389,400	$14.00/LF	$28,000	$23.00	$1,012,000	$17,429,400
6. Government Estimate	$14,165,340	$22.37/LF	$44,740	$25.18	$1,107,920	$15,318,000

Scope & Description

This work consisted of 3500 tons of structural steel, shuttle service and access tower (SSAT) foundations for RSS with 4400 C.Y. concrete and 320 tons rebar; a 300,000 gal. elevated tank and 5100 LF of 2" to 14" piping for sound suppression system; a 2855.5 KVA electrical system with lightning mast; 2 elevators; mods to hammerhead crane; slide wire system; misc. plumbing; fire protections and ECS and earthwork, etc. The Architect Engineer was Reynolds,Smith & Hills

EXHIBIT XI

ABSTRACT OF BIDS

IFB 10-0011-7 of 12/1/76 Bid April 19, 1977
Orbiter Processing Facility High Bay #2, Package 7

BIDDER	TASK I - PCN 79583 MAIN ACCESS PLATFORM	TASK II - PCN 79584 INTEGRATED PIPING & CABLING	TASK III - PCN 79586 CONCRETE MASONRY 2 STORY SUPPORT ANNEX	TOTAL
1. Algernon Blair, Inc. Atlanta, GA	$1,991,000	$1,593,000	$398,000	$3,982,000
2. Beckman Constr. Co. Ft. Worth, Texas	$1,606,000	$ 900,000	$610,000	$3,116,000
3. Frank Briscoe East Orange, NH	$1,900,000	$1,060,000	$500,000	$3,460,000
4. Mayfair Constr. Co. Chicago, Ill	$1,630,732	$1,134,831	$520,391	$3,285,954
5. R&D Construction, Inc. Bryan, Ill	$1,799,000	$ 993,000	$578,000	$3,370,000
6. W&J Construction Corp. Cocoa, FL	$2,100,000	$1,100,000	$540,000	$3,740,000
7. Government Estimate	$1,931,099	$1,483,872	$556,254	$3,961,225

Scope & Description

This work consists of Task I for 14,262 SF of Main Access Platforms with 283 tons of structural steel and 15 Movable Platforms; Task II, Integrated Piping and Cabling Systems with 18,643 LF of 1/4" - 16" GN_2, GO_2, Hypergol, Cryogenic, Pneumatic, ECS, Hydraulic, Compressed Air, Coolants, and Clean Gas Vents and 157,408 LF of Cabling Systems of Wiring, Cable Trays; R.F. pressured, wave guide and Co-AX etc. Task III for 10,200 SF reinforced concrete masonry, Support Annex Office Lab with arch. structural of 372 C.Y. of concrete; 1800 LF fencing; 6000 concrete blocks; 36 tons structural steel, 66 doors, flooring, walls and ceiling systems, mechanical consisting of plumbing, 19.8 tons A/C. and sprinkler; and electrical with 227 light fixtures, cable tray and fire alarms, etc. The A/Es were PRC Tasks I and II and Briel, Rhame, Poynter & Houser, Task III.

EXHIBIT VI

TASK I & II

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR SYSTEMS

SHEET 4 OF 130

DRAWING NO	SHEETS	PCN	LOCATION	PROJECT
I - 79K08118 II - 79K08120	I - II - 100	79583 79584	OPF KSC	HB 2 OPF PLAT. & CABLE - PIPING

WORK ORDER/CONTRACT	ARCHITECT/ENGINEER	ESTIMATOR	CHECKER	CODE
1886 TASK I & II	PRC	Hands PRC	Varndell PRC	C-100

SUBMITTED

CONSTRUCTION COSTS

A/S TRADES			COSTS				SYS. INVOLVED	
DIV. TITLE	QTY	UNIT	$/UNIT	$/BSF	TOTAL	DIV. TOTAL	MECH	ELEC
1. GNL. COND.								
(%)								
2. SITE	N/A					N/A		
CLR/GRUB								
DEMOLITION								
ERTHWK FILL								
PILING								
PAVING								
UTILITIES								
OTHER								
3. CONCRETE	2	CY	147.50	.03		295		
FMWK	72	SF	2.08	.02	150			
REBAR	-							
CONCRETE	2	CY	72.50	.01	145			
4. MASONRY	N/A					N/A		
5. METALS	283	TON	3007	83.43		850,974		
STRUCT STL	283	TON	2231	61.90	631422			
PLTFMS DECK	34262	SF	4.92	6.87	70104			
MISC	9000	LB	16.40	14.47	147624			
ALUM								
6. WOOD/PLASTICS	N/A					N/A		
7. MOISTURE PROTECT	N/A					N/A		
8. DOORS & GLASS	2	EA	95.39	1.87	19077	19077		
9. FINISHES						1123		
PAINTING	-				-			
OTHER CEILING	445	SF	2.52	.11	1123			
10. SPECIALTIES	N/A					N/A		
11. EQUIPMENT	15	PLAT	25861	38.03	387,915	387,915		
12. FURNISHINGS	N/A					N/A		
13. SPECIAL CONSTR.	N/A					N/A		
14. CONVEYING SYS.	N/A					N/A		
HOISTS								
CRANES								
OTHER								
TOTAL A/S						1,259,384		

SYSTEMS TRADES	PIPING/DUCTING CABLING/CONDUIT				COSTS					
DIV. TITLE	SIZES	MATL	QTY	UNIT	$/UNIT	TOTAL	OTHER $	$/LF	TOTAL	DIV. TOTAL
15. MECHANICAL			18643	LF	55.84	1,041,049				1,041,049
A. PLUMBING			6	FIXT	4981	29886				
B. HVAC			19.8	TONS	851	16855				
C. FIRE PROTECT			92	HEAD	507	46689				
D. GASES GO2 & GN2	½	S.S.	2655	LF	33.32	88462				
E. HYPER 304	¼"-4"	S.S.	3070	LF	55.04	168959				
F. CRYO	1"-6"	S.S.	689	LF	183.93	126729				
G. PNEU	¼"-1½"	S.S.	4433	LF	28.69	127168				
H. ECS	12"-16"	AL.	959	LF	201.90	193626				
I. HYDRAULICS	¼"-2"	S.S.	2033	LF	37.65	76539				
J. OTHER CA			3491	LF	26.04	90901				
J1. COOLANTS			600	LF	77.60	46558				
J2. CLEAN GAS VENT			713	LF	40.22	28677				
J3.										
16. ELECTRICAL			21922	LF	6.52	778,767				778,767
A. EXTER SVCS										
B. POWER										
B1. CB PANELS, RECEPT.			381	EA	416.34	158,624				
B2. CONDUIT, TRAY, UNIST.			23041	LF	5.059	134,119				
B3. WIRE & CABLE			119522	LF	2.38	284,468				
C. LIGHTING & ACCESS. FIXTURES			762	EA	73.79	56,231				
D. INSTRUMENTATION										
D1. CABLE/WB/SW/T&C										
D2.										
D3.										
D4.			-							
E. COMMUNICATIONS										
E1. OIS/PO/PA/TD&SA										
E2.										
F. OTHER SYSTEMS										
F1. RF CABLE PRESSURE			600	LF	21.91	13,146				
F2. WAVE GUIDE & CO-AX			6245	LF	24.01	101,933				
F3. FIRE ALARM & ACC.			82	EA	368.85	30,246				
TOTAL SYSTEMS						1,819,816	1,259,384			

DESCRIPTION

SCOPE (circle one)	BASIC PLAN (circle one)	COMMENTS
1. FAIR	A. SQUARE	SYSTEMS FOR TASK I & II ONLY
2. AVERAGE	B. RECTANGULAR	
3. GOOD	C. IRREGULAR	
4. COMPLEX	D. VRY IRREG	
5. SOPHIST.	E.	

DESIGN DATA

TYPE FAC: PLATFORMS SF AREA 29200
CAPACITY: N/A
HEIGHT: N/A STORIES: N/A FT
STRUCT. FRAME: N/A
VOLUME: N/A CF

4/19/77 SPECIAL FEATURES TASK I & II

BECKMAN	2,506,000
MAYFAIR	2,765,563
R&D CONST.	2,792,000
BRISCOE	2,960,000
W&J CONST.	3,200,000
GOVERNMENT	3,394,971
ALGERNON-BLAIR	3,584,000

CONSTRUCTION BID DATA (IFB _____)

MECH. LF:	18,643	$ 55.84 /LF	$	1,041,049
ELEC. LF:	119,522	$ 6.52 /LF	$	778,767
SUBTOT. LF:	138,615	$ 13.42 /LF	$	1,819,816
OTHER:	A/S	$ - /LF	$	1,259,384
SUBTOTAL:	$105.45 /BSF	$ 22.21 /LF	$	3,079,200

SPECIAL COST FEATURES

HAZARDS:	$ N/A	/LF $	
FAB/TEST/CLN/CERT.	$ N/A	/LF $	
GFE:	$ N/A	/LF $	
OTHER SPECIAL COND.	$ 1.78	/LF $	246,336
SUBTOTAL:	$ 23.99	/LF $	3,325,536
TTL PROJ.:	$ 113.88 /BSF	$ 23.99 /LF $	3,325,536

BID DATE: 2/2/77
AWARDED TO: BECKMAN CONST. $ 3,110,00
CONSTRUCT. TIME SPAN: _____ CAL. DAYS: 425
NO. OF BIDS: 7 GOVT. EST. POS: 6
PCT DIF. AWARDED BID & GOVT. EST: 21.12

I, II, & III BIDDERS 4/19/77

BECKMAN	(L)	$ 3,116,000
MAYFAIR		$ 3,285,954
R&D CONST.		$ 3,370,000
BRISCOE		$ 3,460,000
W&J CONST.		$ 3,740,000
GOVERNMENT		$ 3,951,225
ALGERNON-BLAIR		$ 3,981,000
	(H)	$

KSC FORM 21-372 (9/78)

EXHIBIT VII

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TASK III

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR BUILDINGS

SHEET 3 OF 130

DRAWING NO.	SHEETS	PCN	LOCATION	PROJECT
79K08120	28 Sheets	79585	OPF KSC	OPF ANNEX TASK III

WORK ORDER/CONTRACT	ARCHITECT/ENGINEER	ESTIMATOR	CHECKER	CODE / SUBMITTED
1886	BRIEL RHAME POYNTER & HOUSER	Hands PRC-1391	Varndell PRC	CODE C-100

CONSTRUCTION COSTS

DIV. TITLE	QTY	UNIT	$/UNIT	$/BSF	TOTAL	DIV. TOTAL
1. GNL. COND.						
(%)						
2. SITE WORK	1012	CY	41.74	4.84		49,322
CLR /GRUB	-				-	
DEMOLITION	7.2	CY	24.44	.02	176	
ERTHWK /FILL	1012	CY	1.13	.11	1147	
MIX ING GRASSING	2035	CY	1.03	.19	1959	
UTILITIES (S&W)	-		-		-	
PAVING	1057	CY	11.36	1.18	12011	
OTHER FENCE	1800	LF	18.91	3.33	34029	
3. CONCRETE	372.3	CY	195	7.12		72,643
FMWK	7566	SFCA	4.23	3.13	32024	
REBAR	9.26	TONS	1134	1.03	10497	
CON	372.3	CY	76.23	2.78	28381	
CEMENT DECKS	-		-		-	
OTHER	-		-		-	
4. MASONRY	6000	EA	2.67	1.57		16,044
BLOCK	6000	EA	2.67	1.57	16044	
OTHER						
5. METALS	16	TONS	2910	4.56		46,520
STRUC. STL	16	TONS	1176	1.84	18818	
JOISTS & DECK	11.47	TONS	1732	1.95	19867	
MISC.	1650	LB	4.75	.77	7836	
ALUM	-		-		-	
PLTFMS	-		-		-	
6. WOOD/PLASTICS						19,968
CARPENTRY	1280	BF	15.60	1.96	19968	
7. MOISTURE PROTECT.	15200	SF	3.39	5.04		51,458
WATERPRFNG	5200	LF	1.66	.84	8616	
INSULATION	15200	SF	.60	.89	9084	
ROOFING	75	SQ	398.84	2.93	29913	
SIDING	-		-		-	
DECK	-		-		-	
SHT MTL	546	LF		.38	3845	
8. DOORS & GLASS	66	EA	420.47	2.72		27,751
DOORS	66	EA	108.56	.70	7165	
SPECIAL DOORS	64	SF	23.00	.14	1472	
GLASS & GLAZING	625	SF	8.07	.49	5048	
FINISH HARDWARE	173	EA	60.75	1.03	10509	
OTHER CURTAIN WALL	305	LF	14.06	.42	4289	

DIV. TITLE	QTY	UNIT	$/UNIT	$/BSF	TOTAL	DIV. TOTAL
9. FINISHES	28983	SF	1.92	5.48		55,927
WALL SYS	600	SF	2.24	.13	1346	
FLOOR SYS.	9800	SF	1.62	1.55	15844	
CEILING SYS.	5560	SF	4.38	2.39	24376	
PAINT & COVER	28983	SF	.61	1.73	17636	
OTHER	-		-		-	
10. SPECIALTIES						
11. EQUIPMENT						
12. FURNISHINGS						
13. SPECIAL CONSTR.						
ELEV. FLR. SYS.						
OTHER						
14. CONVEYING SYS.						
ELEVS.						
CRANES						
HOISTS						
OTHER						
15. MECHANICAL	19.8	TON	5167	10		102,315
PLUMBING	5	Fix T.	3682	1.80	18410	
FIRE PROTECT.	95	HEAD	267.58	2.49	25421	
VENTILATING	-		-		-	
HEAT & A/C	19.8	TONS	2954	5.73	58484	
CLN. SM (MEPA)	-		-		-	
16. ELECTRICAL & ACCESS.	38496	LF	1.90	7.17		73,101
LIGHTING	227	EA	74.48	1.66	16906	
CABLE & WIRE	38496	LF	.419	1.58	16130	
CONDUIT, Cable Trays, Access.	12188	LF	2.59	3.10	31634	
SWITCHGEAR Panels, C.B. Etc.	21	EA	251.76	.52	5287	
SPCL. SYS. UNINTER. PWR.	-		-		-	
FIRE ALARM	23	EA	136.68	.31	3144	
OTHER	-		-		-	
KSC SPCLZD. CONSTR.						
HYPER. SYS.						
CRYO. SYS.						
PNEU. SYS.						
OTHER						
PROJECT TOTALS						515,049

DESCRIPTION

SCOPE (Circle one)	BASIC PLAN (Circle one)	COMMENTS
1. FAIR	A SQUARE	TASK III ONLY
2. AVERAGE	(B) RECTANGULAR	
(3) GOOD	C. IRREGULAR	
4 COMPLEX	D VERY IRREGULAR	
5 SOPHISTICATED	E	

DESIGN DATA

BLDG. TYPE: BLOCK & MORTAR
CAPACITY:
STRUC. FRAME: CONCRETE REINFORCED
EXTERIOR WALL: CMU
HEIGHT 2 STORIES 27'-8" FT.
GROUND FLOOR AREA 5100 SF
TOTAL FLOOR AREA: 10200 SF
VOLUME: 149968 CF
PERCENT AIR CONDITIONED 100 % 19.8 TONS
OTHER:

4/19/77

SPECIAL FEATURES	TASK III
BECKMAN	610,000
MAYFAIR	520,391
BRISCOE	500,000
B & D	578,000
U & J	540,000
ALGERON-BLAIR	398,000
GOVERNMENT	556,254

CONSTRUCTION BID DATA BFB 10-0011-7

TOTAL BLDG SF: 10650

ARCH/STRUC	$ 31.89	/BSF	$ 339633	
INTERIOR MECH.	$ 9.61	/BSF	$ 102316	
INTERIOR ELEC:	$ 6.86	/BSF	$ 73101	
TOTAL INTERIOR:	$	/BSF	$	
TOTAL EXTERIOR:	$	/BSF	$	
TOTAL CONSTR.	$ 48.36	/BSF	$ 515050	
ADDITIONAL: A/C	$ 3.87	/BSF	$ 41204	
B.	$	/BSF	$	
TOTAL PROJECT EST:	$ 52.23	/BSF	$ 556,254	

BID DATE: 2/2/77
AWARDED TO: BECKMAN CONST. $ 3,116,000
CONSTRUCTION TIME SPAN: 210 CALENDAR DAYS
NO OF BIDDERS: 7 POSITION OF GOVT. EST. 6
PERCENT DIFFERENCE, AWARDED BID AND GOVT. EST.

See Above

BIDDERS See Sheet 4

(L) $
$
$
$
$
$
$
(H) $

KSC FORM 21-371 (9/76)

EXHIBIT VIII

I. Abstract of Bids

TASK I PCN 75889 CONSTRUCTION OF VAB MODIFICATIONS (FOR THE SPACE SHUTTLE)

IFB #10-0031-5 ISSUED MARCH 31, 1975 BID JUNE 5, 1975

BIDDER	TOTAL
1. Continental Consolidated Corp Pompano Beach, Fla	$6,544,000
2. Mayfair Construction Co. Chicago, Ill	5,137,827
3. Morrison Knudsen, Inc Darien, Conn	7,518,200
4. R & D Constructors, Inc Parkridge, Ill	5,139,000
5. Frank Brisco Co, Inc. E. Orange, N. J.	5,380,000
6. Butler & Oenbrink, Inc Rockledge, Fla	5,188,000
Government Estimate	4,635,778

DESCRIPTION:

The work includes Modification to High Bay 3 Extensible Platforms and new checkout cells in High Bay 4 Modification to the Transfer Aisle North Door, Relocation of JIB Cranes, and Modifications to Related Support Facilities including about 750 tons of new Structural Steel.

The A&E Firm is Seelye Stevenson Value & Knecht, Inc., of New York City.

EXHIBIT IX

ABSTRACT OF BIDS

TASK I - PCN 77126 - CONSTRUCTION OF MODIFICATIONS TO CONVERT MOBILE LAUNCHER NO. 3 TO MOBILE LAUNCHER PLATFORM NO. 1 AND MODIFICATIONS TO CONVERT LAUNCH PAD 39A FOR THE SPACE SHUTTLE - PCN - 77112, KSC, FLORIDA IFB #CC-10-0032-4 ISSUED 4/22/75, BID 6/25/75.

BIDDER	TOTAL	
I. Blount Brothers Montgomery, Alabama	$18,749,000	-7% (Below GE)
II. Frank Briscoe Co. East Orange, New Jersey	21,500,000	
III. Continental Consolidated Corp. Pompano Beach, Florida	19,600,000	
IV. Mayfair Construction Co. Chicago, Illinois	26,689,800	
V. United States Steel Corp. Atlanta, Georgia	32,269,200	
VI. Government Estimate	20,125,095	3/6

The A&E Firm is Reynolds, Smith and Hills of Jacksonville Fla.

EXHIBIT X

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR SYSTEMS

SHEET 3 OF 122

DRAWING NO. 79K11397/79K14105	SHEETS 253/3	PCN 79736/81764	LOCATION KSC LC-39 MLP#2	PROJECT TASK I / TASK II PIPING & CABLING/BLAST DECK
WORK ORDER/CONTRACT 2193 IFB#10-0054-8	ARCHITECT/ENGINEER PRC		ESTIMATOR Thomason PRC-1391	CHECKER C. Pierce, PRC-1391
				CODE C-100
				SUBMITTED 5-9-78

CONSTRUCTION COSTS

A'S TRADES / DIV. TITLE	QTY	UNIT	COSTS $/UNIT	COSTS $/LF	COSTS TOTAL	COSTS DIV. TOTAL	SYS. INVOLVED MECH	SYS. INVOLVED ELEC
1. GNL. COND.								
(15%)					108,955		X	
2. SITE								
CLR/GRUB								
DEMOLITION								
ERTHWK/FILL								
PILING								
PAVING								
UTILITIES								
OTHER								
3. CONCRETE								
FMWK								
REBAR								
CONCRETE								
4. MASONRY								
5. METALS	86.6	Ton	3,609	4.49		312,522	X	X
STRUCT STL	42.6	Ton	4,404	2.69	187,613			
MACHINED STEEL TASK II	89	EA	295	.38	26,289			
BLAST DECK	44	Ton	2,241	1.42	98,620			
6. WOOD/PLASTICS								
7. MOISTURE PROTECT								
8. DOORS & GLASS								
9. FINISHES								
PAINTING								
OTHER								
10. SPECIALTIES								
11. EQUIPMENT								
12. FURNISHINGS								
13. SPECIAL CONSTR.								
14. CONVEYING SYS.								
HOISTS								
CRANES								
OTHER								
TOTAL A/S						312,522		

SYSTEMS TRADES / DIV. TITLE	PIPING/DUCTING CABLING/CONDUIT SIZES	MATL	QTY	UNIT	COSTS $/UNIT	COSTS TOTAL	+ OTHER $	- $/LF	COSTS TOTAL	COSTS DIV. TOTAL
15. MECHANICAL	1/4 to 14	VAR	25,762	LF	35.79			35.79		922,089
A. PLUMBING	1/2 to 4"	GALV	515	LF	29.57	15,231				
B. HVAC DAMPER CONTROL	1/4"	S/S	175	LF	46.59	8,154				
C. GFE to	1/2"	S/S	9,741	LF	.36	3,487				
D. HALON	1/2 to 2"	STEEL	406	LF	33.73	13,697				
E. COOLANTS	1-1/2"	S/S	216	LF	168.33	36,359				
F. CRYO	2" to 14"	S/S	1,551	LF	118.27	183,444				
G. PNEU	1/4 to 1-1/2	S/S	6,960	LF	35.45	247,416				
H. ECS STRAIGHT SPOOL SECTIONS-GFE	6-14"	ALUM	430	LF	474.03	203,834				
I. HYDRAULICS	3/4 to 2"	S/S	1,643	LF	94.71	155,609				
J. OTHER VENT	2" to 3"	S/S	619	LF	40.56	25,108				
J1 O_2 Analyzer	3/8"	CU	1,550	LF	7.26	11,254				
J2 HAZ. GAS	1/4 to 3/4"	S/S	881	LF	15.54	13,694				
J3. DEMOLITION	1/4 to 2"	S/S	1,056	LF	4.56	4,902				
16. ELECTRICAL			43,884	LF	18.82			18.82		825,930
A. EATER SVCS										
B. POWER	3/4 to 3	GALV COND	3,341	LF	10.73	35,858				
B1. UPS	2-1/2	GALV COND	100	KVA	215.78	21,578				
B2.										
B3.										
C. LIGHTING										
D. INSTRUMENTATION										
D1. CABLE/WB/SW/T&C	16-20 AWG	CU	38,405	LF	18.77	720,808				
D2. UCS	60 COND.	CU	1,868	LF	20.52	38,339				
D3.										
D4.										
E. COMMUNICATIONS										
E1. OIS/PD/PA/TD&SA										
E2.										
F. OTHER										
F1. HALON CONTROLS	14 AWG	CU	270	LF	34.62	9,347				
F2.										
F3.										
ARCH/STRUCT							312,522	4.49		312,522
TOTAL SYSTEMS						1,748,019	312,522			2,060,541

DESCRIPTION

SCOPE (circle one)	BASIC PLAN (circle one)	COMMENTS
1. FAIR	A. SQUARE	Hoists - NIC
2. AVERAGE	B. RECTANGULAR	Sound Suppression-NIC
3. GOOD	(C) IRREGULAR	Halon System-Added
(4) COMPLEX	D. VRY IRREG.	Blast Deck-Added
5. SOPHIST.	E.	Very Good Gov. Estimate

DESIGN DATA

TYPE FAC: All Steel Structure AREA: 21,014
CAPACITY: 158' x 133' x 25' 3 levels
HEIGHT: 3 STORIES: 25 FT
STRUCT. FRAME: steel
VOLUME: 525,350 CF

SPECIAL FEATURES

GFE MTL. VALUE; MECH. 1,091,193
GFE MTL. VALUE, ELEC. 213,031
BLAST DECK WITH BENCH MARKS.
ECS DUCTWORK SYSTEM

BIDDER	TASK I	TASK II	TOTAL
BLAIR	1,885,500	135,500	2,021,000
GOV'T.	2,104,807	104,594	2,209,401
MAYFAIR	2,176,093	175,118	2,351,211
W&J	2,235,780	133,000	2,368,780
HOLLOWAY	2,313,000	161,000	2,474,000

CONSTRUCTION BID DATA (IFB 10-0054-8)

MECH. LF:	25,762	$35.79 /LF	$922,089
ELEC. LF:	43,884	$18.82 /LF	$825,930
SUBTOT LF:	69,646	$25.10 /LF	$1,748,019
OTHER: A/STR. 86.6 tn		$ 4.49 /LF	$ 312,522
SUBTOTAL: $	98.06 /BSF	$29.59 /LF	$2,060,541

SPECIAL COST FEATURES

HAZARDS: AMENDS. #1		$ .45 /LF	$ 31,229
FAB/TEST/CLN/CERT: #2		$ .06 /LF	$ 4,039
GFE:		$ /LF	
OTHER: SPL. CONDITIONS		$ 1.63 /LF	$113,592
SUBTOTAL:		$ 2.14 /LF	$148,860
TTL PROJ: $	105.14 /BSF	$ 31.72 /LF	$2,209,401

BID DATE: 5-24-78
AWARDED TO: ALGERNON BLAIR $2,021,000
CONSTRUCT. TIME SPAN: CAL. DAYS. 210
NO. OF BIDS: 5 GOVT. EST. POS. 2 of 5
PCT DIF, AWARDED BID & GOVT. EST: -8.5%

BIDDERS

ALGERNON BLAIR	(L)	$ 2,021,000
MAYFAIR CONST.		$ 2,351,211
W&J CONST.		$ 2,368,780
HOLLOWAY		$ 2,474,000
		$
		$
GOV. ESTIMATE	(H)	$ 2,209,401
		$

KSC FORM 21-372 (8/78)

EXHIBIT XII

TASK I ORBITER APPROACH AND LANDING TEST FACILITY PCN 77421

TASK II SHUTTLE CARRIER AIRCRAFT MATING FACILITY, PCN 77421 FLIGHT RESEARCH CENTER, EDWARDS, CALIFORNIA

IFB 10-0038-5 Issued 4/2/75 Bid 5/16/75

Bidder	Task I	Task II	Total
1. The Cardan Co, Inc Beverly Hills, Calif.	$1,791,350	$1,917,986	$3,709,336
2. C. B. Holder Inc & Equinox Joint Venture, Malibu, Calif	-	-	3,685,000
3. Jones Bros.Construction Corp Beverly Hills, Calif.	1,321,000	2,743,640	4,064,640
4. Keller & Grant Inc El Monte, Calif	2,690,000	1,375,000	4,065,000
5. Oberg Construction Co. Simi Valley, Calif.	2,040,000	1,650,000	3,690,000
6. Olson Construction Co. San Diego, Calif.	2,076,736	1,780,000	3,856,737 *
7. P. K. Construction Co. San Diego, Calif.	2,148,791	1,650,000	3,798,791
8. Sante Fe Engineers Inc Lancaster, Calif.	1,500,600	2,067,567	3,567,567
Government Estimate	$2,112,658	$1,820,602	$3,933,260

Description
The work includes Site Preparation, 33700 SF Maintenance Hangar and Shops, Shuttle Orbiter Mating Structure Area, Hypergolic Fuel & Oxidizer Area, Fire Protection Pump Station, Concrete Towaway and Service Apron, Asphalt Concrete Parking Area and Road Paving, Site Domestic Water & Fire Protection Lines, Electrical Power and Communications Systems & Sewage Collection and Disposal.

The A&E Firm is V.T.N. Consolidated, Inc of Irvine, California

*Error

EXHIBIT XIV

ABSTRACT OF BIDS

IFB 10-0038-6 of 9/11/78 Bid Oct. 20, 1978
Vertical Processing Facility Phase IIA & B, PCNs 81424 and 81914

BIDDER	TASK I ELEVATING PLATFORMS WEST CELL	TASK II FIXED PLATFORMS HOOS	TASK III VERTICAL PAYLOAD HANDLING DEVICE WEST CELL	TASK IV PAYLOAD SUPPORT FITTING ASSEMB.	OPTION A ELEVATING PLATFORMS EAST CELL	OPTION B VERTICAL PAYLOAD HANDLING DEVICE	TOTALS
1. Algernon Blair Atlanta, GA	$201,000	$ 933,000	$379,000	$ 46,000	$172,000	$323,000	$2,054,000
2. Nello Steel Corp. Orlando, FL	$166,320	$ 812,422	$474,180	$ 56,830	$144,888	$416,180	$2,074,300
3. PHC Corp. Santa Clara, CA	$607,500	$1,119,300	$767,900	$288,700	$307,900	$707,500	$3,739,000
4. Mayfair Const. Chicago, ILL	$184,000	$648,000	$342,000	$ 38,000	$188,000	$342,000	$1,883,000
5. H&J Constr. Corp. Cocoa, FL	$186,000	$826,000	$367,900	$ 37,000	$186,000	$367,000	$1,949,700
6. Government Estimate	$239,279	$1,208,262	$488,460	$110,276	$250,099	$803,362	$3,326,737

Scope & Description

The work consists of 6 elevating platforms and retractable access platform on 6 levels of each cell; 2 vertical payload handling devices (V.P.H.D) (Supports human, payload support fixtures (30 ea), compressed air systems, ambient system, electrical camcright fluorescent light systems, and explosion proof receptacles, and installing GFE winch, etc.

EXHIBIT XIII

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR SYSTEMS

SHEET 4 OF 39

DRAWING NO	SHEETS	PCN	LOCATION	PROJECT
79K07830	DRAWING 40	76475	LAUNCH COMPLEX 39	MLP TAIL SERVICE MASTS

WORK ORDER/CONTRACT	ARCHITECT/ENGINEER	ESTIMATOR	CHECKER	CODE / SUBMITTED
0023	PRC	C. CARDONA PRC-1391	S. LOCKARD PRC-1391	C-100 / 4/27/77

CONSTRUCTION COSTS

A'S TRADES / DIV. TITLE	QTY	UNIT	COSTS $/UNIT	COSTS $/LF	COSTS TOTAL	COSTS DIV. TOTAL	SYS. INVOLVED MECH	SYS. INVOLVED ELEC
1. GNL. COND.								
(%)								
2. SITE								
CLR'GRUB								
DEMOLITION								
ERTHWK/FILL								
PILING								
PAVING								
UTILITIES								
OTHER								
3. CONCRETE								
FMWK								
REBAR								
CONCRETE								
4. MASONRY								
5. METALS	188,156	LB	2.21			416,012		
STRUCT STL	188,156	LB	2.16		406,176			
PL TFMS								
MISC HINGES, ETC.	--	--	--		9,836			
ALUM								
6. WOOD/PLASTICS								
7. MOISTURE PROTECT								
8. DOORS & GLASS								
9. FINISHES	31,000	SF	.44			13,726		
PAINTING &SANDBLAST	31,000	SF	.44		13,726			
OTHER								
10. SPECIALTIES								
11. EQUIPMENT								
12. FURNISHINGS								
13. SPECIAL CONSTR.								
14. CONVEYING SYS.	47,146	LB	4.67			220,204		
XXXXX METAL	47,146	LB	3.95		186,417			
XXXXX SHOCK ABSORB	2	EA	16,890.50		33,787			
XXXXXCABINET ETC								
TOTAL A/S					649,942			

SYSTEMS TRADES / DIV. TITLE	PIPING/DUCTING CABLING/CONDUIT SIZES	MATL	QTY	UNIT	COSTS $/UNIT	COSTS TOTAL	COSTS OTHER $	COSTS $/LF	COSTS TOTAL	COSTS DIV. TOTAL
15. MECHANICAL	1/4 TO 2"	S/S	998	LF	72.55	72,406				72,406
A. PLUMBING										
B. HVAC										
C. FIRE PROTECT										
D. HALON										
E. HYPER										
F. CRYO LOX & LH2	1/4" TO 2"	S/S	998	LF	72.55	72,406				
G. PNEU										
H. ECS										
I. HYDRAULICS										
J. OTHER										
J1.										
J2.										
J3.										
16. ELECTRICAL	1 TO 7	VAR	620	LF	17.16	10,640				10,640
A. EXTER SVCS										
B. POWER										
B1. SWITCHES	1 1/2 TO 3 HP		14	EA	105.29	1,474				
B2. MOTORS	"		8	EA	399.63	3,197				
B3. BOXES			8	EA	43.38	387				
C. LIGHTING										
D. INSTRUMENTATION										
D1. CABLE/WB/SW/T&C	TO 70 CONT	VAR	620	LF	2.87	1,780				
D2.										
D3.										
D4. OTHER	--	VAR	VAR	--	--	2,446				
E. COMMUNICATIONS										
E1. DIS/PO/PA/TD&SA										
E2.										
F. OTHER *SPARES										24,601
F1. 79K08670-1			1	EA	7273	7273				
F2. 79K08670-2			2	EA	7563	15,126				
F3. 79K08670-3			2	EA	1,101	2,202				
TOTAL SYSTEMS										

DESCRIPTION

SCOPE (circle one)	BASIC PLAN (circle one)	COMMENTS
1. FAIR	A. SQUARE	
2. AVERAGE	B. RECTANGULAR	
3. GOOD	C. IRREGULAR	
4. COMPLEX	D. VRY IRREG.	
5. SOPHIST.	E.	

DESIGN DATA

TYPE FAC TAIL SERV SF AREA N/A
CAPACITY N/A
HEIGHT -0- STORIES 31 FT.
STRUCT. FRAME STRUCT STEEL
VOLUME 4,185 CF

SPECIAL FEATURES

AMEND #1 (4/18/77) $(13,673)
* SPARES $24,601
AMEND #2 (5/18/77) $(73,824)

CONSTRUCTION BID DATA (IFB 10-0049-7)

MECH LF: 998	$ 72.55 /LF	$ 72,406
ELEC. LF: 620	$ 17.16 /LF	$ 10,640
SUBTOT LF 1,618	$ /LF	$ 83,046
OTHER: A/S MECH	$ /LF	$ 640,942
SUBTOTAL: $ /BSF	$ /LF	$ 732,988

SPECIAL COST FEATURES

HAZARDS: AMEND #1	$ /LF	$ (13,673)
FA XXXXXXXXXXX: #2	$ /LF	$ (73,824)
GFE: 260 + 58,359	$ /LF	$
OTHER: * SPARES	$ /LF	$
SUXXXXX SPCL COND	$ /LF	$ 19,365
TTL PROJ $ N/A /BSF	$ 410.91 /LF	$ 664,862

BID DATE: 5.11.77
AWARDED TO BELKO STEEL $ 696,410
CONSTRUCT TIME SPAN: 208 CAL. DAYS:
NO OF BIDS: 3 GOVT. EST. POS: 1 of 3
PCT DIF, AWARDED BID & GOVT. EST. 4.7%

BIDDERS

BELKO STEEL CORP	(L)	$ 696,410
INDUSTRIAL STEEL		$ 798,693
		$
		$
		$
		$
		$
	(H)	$

NSC FORM 21-372 (9/70)

EXHIBIT XV

ARTICLE 7

SMALL BUSINESS SUBCONTRACTING PROGRAM (MAINTENANCE, REPAIR AND CONSTRUCTION) (JANUARY 1978)

(a) The Contractor agrees to establish and conduct a small business subcontracting program which will enable small business concerns to be considered fairly as subcontractors, including suppliers, under this contract. In this connection, the Contractor shall designate an individual to (i) maintain liaison with the Government on small business matters, and (ii) administer the Contractor's Small Business Subcontracting Program.

(b) The Contractor shall submit NASA Form 524 each quarter in accordance with the instructions provided on the form. The reporting requirements of this subparagraph (b) do not apply to small business Contractors, small business subcontractors or educational and nonprofit institutions.

(c) The Contractor further agrees (i) to insert the "Utilization of Small Business Concerns" clause in subcontracts which offer substantial subcontracting opportunities, and (ii) to insert in each such subcontract exceeding $500,000 a clause conforming substantially to the language of this clause except that subcontractors shall submit NASA Form 524 direct to the Government addressees prescribed on the Form. The Contractor will notify the Contracting Officer of the name and address of each subcontractor that will be required to submit a report on NASA Form 524.

ARTICLE 8

MINORITY BUSINESS ENTERPRISE CONSTRUCTION SUBCONTRACTING (JUNE 1978)

(a) It is the policy of the Government that minority business enterprises shall have the maximum practicable opportunity to participate in the performance of Government contracts.

(b) The Contractor agrees to use his best efforts to carry out this policy in the award of his subcontracts to the fullest extent consistent with the efficient performance of this contract. As used in this contract, the term "minority business enterprise" means a business, at least 50 percent of which is owned by minority group members or, in case of publicly owned businesses, at least 51 percent of the stock of which is owned by minority group members. For the purposes of this definition, minority group members are Negroes, Puerto Ricans, Spanish-speaking American persons, American-Orientals, American-Indians, American Eskimos, and American Aleuts. The Contractor shall ascertain that subcontractors presented as minority firms for purposes of fulfilling the requirements of this clause are bona fide minority firms engaged in, or newly organized to engage in, the activities for which they are to be hired and shall obtain evidence from them regarding their status as minority business enterprises.

ARTICLE 8 (Cont'd)

(c) In keeping with national policy, it is NASA's objective that a vigorous procurement program of actively seeking out and soliciting minority firms be accomplished at the prime Contractor and subcontractor levels to ensure their equitable participation in this construction effort. It is NASA's intent that at least twenty percent (20%) of the total value of all subcontracts resulting from this prime contract shall be awarded to minority business enterprises as defined above. Joint venture subcontracts shall be considered, in meeting the requirements of this subparagraph, only as to the proportionate value of the subcontract which accrues to any minority firms involved. For the purpose of this program, the term "subcontractor" includes all construction, modifications, supplies and material and service work contracted for by the prime contractor in the prosecution of the work.

(d) Prior to commencement of the contract work, the Contractor agrees to have established a program for the employment of specific minority enterprises in accordance with the Minority Business Enterprise Subcontracting Program Plan which has been submitted to the Contracting Officer, and to implement and aggressively conduct such a program during the course of work under this contract. In this connection the Contractor shall:

(1) Designate a liaison officer who will administer the Contractor's Minority Business Enterprise Subcontracting Program.

(2) Develop, maintain and utilize comprehensive minority business resource files.

(3) Provide adequate and timely consideration of the potentialities of known minority business enterprises in all "make-or-buy" decisions, with timely notice to the Contracting Officer prior to entering into any subcontract of $10,000 or more of the extent to which minority firms have been considered for the award.

(4) Assure that known minority business enterprises will have an equitable opportunity to compete for subcontracts, particularly by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation of minority business enterprises.

Mr. Joseph A. Brown, CCE
DD-FED Lead Cost Engineer
Design Engineering Directorate, DD-FED
Kennedy Space Center, Florida 32899

SUBJECT: "Bid Cost of Shuttle Facilities"

Mr. Joseph A. Brown is employed as a Lead Cost Engineer for the National Aeronautics & Space Administration's Design Engineering Directorate. He prepares and reviews Government and contractor's construction and GSE cost estimates amounting to over $2 billion for design, fabrication and construction. He is currently working on facility costs and requirements for future space exploration of such programs as the Space Station and Space Shuttle. Mr. Brown received his formal education at the University of Florida. His major study was Architectural and Structural Design, Estimating, Management, Supervision, and Methods & Materials where he received a "BBC" Degree. Mr. Brown has completed courses in Management, Procurement, Contract Cost, and NASA PERT. He received a State and County license for Construction Cost Engineering July 1968. He has done consulting, estimating, and bidding for general and sub-contractors for commercial, industrial, and residential complex developers-builders, covering Florida, Georgia, Alabama and California and Walt Disney World's Contemporary Resort Hotel. He is the Past President and Charter Member of the Florida Section of American Association of Cost Engineers, AACE 1969 "Member of the Moment;" General Arrangements Chairman 1975 Annual Meeting, SAME; Canaveral Post's "Engineer of the Year," and NASA/Kennedy Space Center's "Federal Employee of the Year." September 14, 1976 he became the first CCE in Florida. He is writing an Estimating Workbook, "How to Sharpen your Bidding." He has published many technical papers including "Cost Escalation and Labor Productivity, What we can do About it," and How does the Low Bidder Get Low - and Make Money?" and "Construction Cost Control - After Bidding," "KSC Cost Index for Construction Management." He has conducted Construction Cost Estimating Seminars in Miami, San Francisco and Milwaukee.